

Teaching Effectiveness and Student Achievement: Examining the Relationship

Cody Ding

Helene Sherman

University of Missouri-St. Louis

Introduction

Two decades after the report “A Nation at Risk” by National Commission on Excellence in Education (A Nation at Risk: The imperative of educational reform, 1983), education professionals are still struggling with the issue of improving academic achievement as measured by standardized test scores. To reinforce the sense of national urgency about this issue, The Teaching Commission (2004) published a new report, “Teaching at Risk”, stating that teaching quality is a critical factor in attempts to improve our national’s global competitiveness, security and future. Whether there is any association between teaching quality and the nation’s ability to compete in a global economy is an empirical question that should be addressed in a the context of carefully defining teacher quality.

Purpose

Purpose of this article is to examine the issue of the relationship between teacher effectiveness and students’ achievement as measured by test scores. A strong belief among policy makers and public as well as private funding agencies is that test scores are directly related to the quality of teaching effectiveness (Kupermintz, 2002). This relationship implies that there could be a direct causality among teacher preparation, teacher quality, and student achievement. The terms “teaching effectiveness” and “teacher effect” are often used interchangeably in these conversations. In the following sections, we will discuss

several aspects of each construct. Particularly, we discuss the following issues: (1) teacher effects, (2) teaching or teacher effectiveness, and (3) an educational model of school and teacher effects on student achievement. Fundamental research issues and concerns as well as an alternative conceptual framework for studying the relationship of achievement and teaching will be highlighted.

Comparing Teacher Effects and Teacher Effectiveness

In recent years, research on effectiveness of teaching has reported a direct relationship between its quality and student learning (Darling-Hammond & Young, 2002). Odden, Borman, and Fermanich (2004) indicated that teachers have a significant influence on student learning. However, the definition of teaching effectiveness is not clear and, in fact, is operationalized in terms of teacher effects, which are more easily quantified in research studies. Based on the literature discussion by Odden, Borman, and Fermanich (2004), the following teacher factors or effects are specifically identified. They were found to be, to different degrees, associated with student achievement and include: (1) years of teaching (Goldhaber & Brewer, 1997), (2) major of undergraduate study, particularly for mathematic and science teachers (Monk, 1994), (3) ACT or SAT test scores (e.g., Ferguson, 1998), (4) course work or degree obtained (Rowan, Chiang, & Miller, 1996), (5) quality of high school (Goldhaber & Brewer, 1997), (6) earning of a license (Darling-Hammond & Young, 2002), and (7) verbal ability (Ehrenberg & Brewer, 1995). Odden et al. (2004) suggest that these variables should be defined further, especially for the variables that show mixed effects.

Whereas these teacher effects can be defined relatively easily and studied, the teacher effectiveness is a very different matter. While the teacher effects can be operationalized as, for instance, the gender, experience and salary level of teachers, the

operationalization of teacher or teaching effectiveness is not clearly articulated. For example, it is relatively a simple matter to study the relationship between teachers' salary and student achievement as a teacher effect since there is a large variation in teachers' salary. One could conclude, therefore, that students taught by higher paid teachers will be more successful on tests than pupils of lower paid teachers. However, such a teacher effect cannot be necessarily translated into teacher effectiveness; that is, a teacher's salary may not have anything to do with whether a teacher is effective in his/her teaching. The concept of teaching effectiveness needs to be clearly articulated and defined before its relationship with other factors (e.g., years of teaching) can be empirically verified without ambiguity.

It is imperative to clearly differentiate the concepts of teacher effects and teacher effectiveness. Such a difference is not merely a semantic or rhetorical matter. Rather, it has a great implication for research on teachers and teaching practices as well as on the policies related to teachers in the current education reform effort. Misuse of these two concepts may lead to great simplicity in terms of how we consider teacher effectiveness and efforts to improve student achievement. A teacher may have less experience in teaching but she/he could be very effective in teaching. Conversely, a teacher who might have solid content knowledge might be a very ineffective teacher. In a way, viewing from the perspective of latent variable analysis framework, teacher effects are observable variables such as gender or salary level. The teacher or teaching effectiveness is a latent variable, which needs to be operationalized by using proxy measures. For example, one could operationalize teaching effectiveness in terms of response to a need the student feels or the student involvement in identifying his/her learning needs and outcomes. Therefore, we argue that there is a great danger in equating teacher effects with teacher effectiveness since a teacher effect, such the type of college degree, does not always translate into instructional effects. The latter construct may have little to no impact on student achievement. Such misunderstandings of teacher effects and teaching effectiveness can lead to inappropriate conclusions that have direct impact on

professional development strategies, on teacher preparation program content, and on professional judgment.

If teacher or teaching effectiveness is conceptually different from teacher effect, what is teacher effectiveness? Are there any empirical studies that investigate the link between teacher effectiveness and student learning?

Literature Review

Evidence of teaching effectiveness

Many studies and articles have claimed that there is a relationship between teacher effectiveness and students' achievement. Generally, teacher effectiveness or effective teaching has been characterized in terms of specific teaching practices (e.g., Kemp & Hall, 1992; Taylor, Pearson, Clark, & Walpole, 1999). For example, an effective teacher would employ systematic teaching procedures (Kemp & Hall, 1992) and spend more time working with small groups throughout the day (Taylor et al., 1999). Porter (2002) found that pupils make more academic gains when instruction is effectively connected to assessment. Clearly, teacher effectiveness or effective teaching can be operationalized in different ways but they are much less straightforward than the measures of "teacher effects."

Empirical Data

Sanders and his associates (1996, 1997, & 2000; Rowan et al., 1996; Webster, Mendro, Orsak, & Weerasinghe, 1997) analyzed data from the Tennessee value-added assessment system. The research used mixed-modeling to conduct longitudinal analyses of student achievement to make estimates of school, class size, and teacher effects. Data from these studies seems to support the claim that the most important factor influencing student learning is the teacher. The researchers offer the definition of "teacher effectiveness" as the characteristics that seem to be identical to

“teacher effects,” such as effects of classroom size and spending differences. Summarizing from the studies, Sanders (2000) stated: “differences in teacher effectiveness is the single largest factor affecting academic growth of populations of students” (p. 8). Wright, Horn, and Sanders (1997) stated: “Effective teachers appear to be effective with students of all achievement levels, regardless of the level of heterogeneity in their classrooms. If the teacher is ineffective, students under that teacher’s tutelage will achieve inadequate progress academically, regardless of how similar or different they are regarding their academic achievement” (p. 23). However, what seemed to be missing in these analyses was the most important factor—defining “teacher effectiveness.” The study reported the regression coefficients for teacher variable, which was the most significant variable in the model for predicting a gain score between two tests. But the studies did not clearly define teacher effectiveness, nor did the studies indicate what the general notion of “teacher variable” meant. In addition, the studies hypothesized the relationship between teacher effectiveness and student gain, but what teacher effectiveness indicated was unclear and not defined. Thus, their claim about teacher effectiveness and student achievement could not be supported by the data.

Similar problems exist for other empirical studies in analyzing such a relationship. For example, the data from the study by Mendro, Jordan, Gomez, Bembry, and Anderson (in press) on long-term teacher effects on student achievement failed to support their conclusions on long-term effects of teacher effectiveness. As in the study by Wright et al. (1997), there was no operational definition of what teacher effectiveness was, although the term “teacher effectiveness” was used. It was not clear from their analyses what the long-term effects were and how the teacher effectiveness, if it were defined at all in some way, linking the constructs of teacher effectiveness and student achievement was connected to the students’ achievement.

Thus, the relationship between teacher effectiveness and student achievement needs to be further examined carefully. Although there is a theoretical basis for such a relationship, the evidence is far from convincing. In addition, the data on teacher effectiveness are often affected by uncontrolled and complex variables unrelated to schools, pupils, and the teaching act. Even teacher effect variables, such as the higher education institutions from which teachers graduated, are not often provided to researchers by the universities or schools. Thus, before making any policies regarding teachers (e.g., teacher salary) based on student achievement gain, especially a long-term gain (e.g., over entire elementary school, middle school, or high school), more study is necessarily to fully examine the issues involved.

Multilevel Interactive Education Model

Odden (2004) suggests a multilevel educational model to study teaching effectiveness and its relationship to student achievement on tests. The goal of this model is to estimate the effect of a particular variable as one of several variables included in a multilevel analytical and nested model of school, teacher, and student. Their multilevel educational model is duplicated here in Figure 1 and such a model can be analyzed via multilevel analysis (Raudenbush & Bryk, 2002).

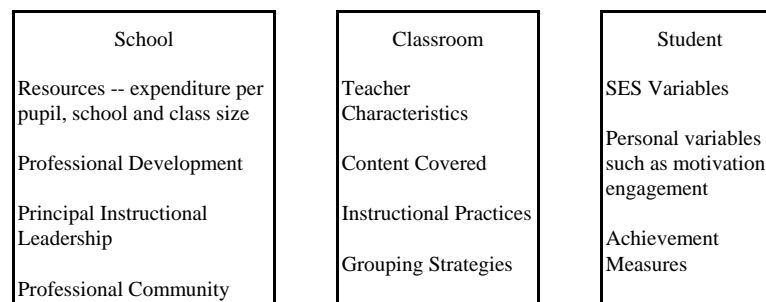


Figure 1. Educational model of school and classroom effects on student learning gains proposed by Odden et al.

Whereas this is a useful model in studying effects of school and classroom on student learning, especially from the multilevel

analytical perspective, one major flaw is that it does not clearly define teacher effectiveness and how teacher effectiveness interacts with other variables such as teacher characteristic variables. In addition, the model does not explicitly articulate the interaction among school, teacher, and student. That is, the model ignores the active role the students and their family and community play. Learning and motivation theories have suggested that learning is a dynamic process in which learners and instructors are highly interactive and connect new concepts to those previously understood (Vygotsky, 1978).

The findings from these studies support the idea that student learning is an interactive process in which student characteristics do influence the outcomes of their own learning. In other words, effective teaching is conditioned on student characteristics, just as the student learning is conditioned on the effective teaching. The effort to search for one-size-fit-all kind of teaching effectiveness, regardless of the student characteristics, is of questionable value to educators and students.

Although effective teaching is fundamental to learning, over emphasis on the importance of teaching methodology in the process of learning may imply that we should ignore the dynamic learning process in which students are the significant players, not just teachers. For example, a study conducted by Milanowski (2004) analyzed teacher performance and student achievement. The researcher found that when the student characteristics are ignored in the analysis, the degree to which students do better or worse than expected depends on the prior learning level of the student.

Just as a patient's quality of health is a characteristic affected by many complex and interrelated variables and cannot be entirely attributed to the type and quality of a physician's medical practice, student achievement is a result of a variety of factors. These can include teacher effects, teacher effectiveness (when clearly defined), student motivation, parental involvement, funding, the work and dispositions of all involved and quality of leadership of school administrators.

Based on our arguments regarding the importance of dynamic learning processes between students and teachers, we propose a “multilevel interactive education model.” This model includes all the components proposed by Odden et al. (2004) in their multilevel educational model, but it also explicitly articulates the dynamic nature of learning process. This model is depicted in Figure 2. In addition, it differentiates teacher effects from teacher effectiveness, and it holds students, teacher, and school equally accountable for the student learning. For example, if a student of low SES fails to meet adequate yearly progress while his/her non-low SES counterparts do not, we need to address the issues of student characteristics rather than primarily attributing success or failure to the quality of classroom instruction. That is, we need to know more about the learning needs of this particular student before we solely focus on the change of teaching methods, which may inadvertently have negative influence on rest of the students.

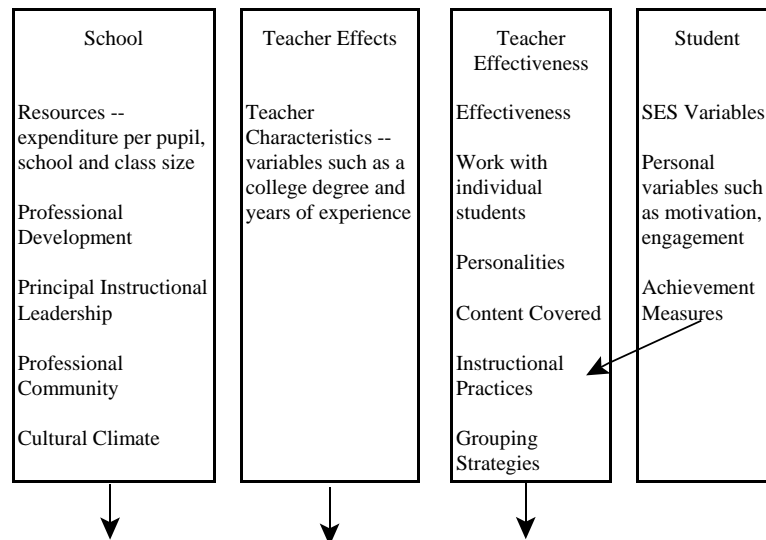


Figure 2. Multilevel dynamic education model of school, teacher, and teacher effectiveness on student learning

The proceeding model could be used as a framework for various studies. Research using the dynamic education model in Figure 2 could focus on interactive processes of student learning and could, particularly, examine the effects of teacher effectiveness as well as teacher effects, respectively. Ignoring the interactive learning processes between teacher and student may results in futile effort of improving student learning. Over emphasis on the teachers' role in student learning may lead to disappointing findings. The inconsistent results from study by Kimball, White, Milanowski, and Borman (2004) with respect to the question of whether teachers' evaluation scores were associated with student learning may suggest that the teachers of one-size-fit-all are not all things to all students. Teacher effectiveness is conditioned on the student characteristics. Only when we recognize the importance of students' role in their own learning, can we meaningfully address the issues related to teacher effectiveness and teacher effects.

References

- Darling-Hammond, L., & Young, P. (2002). Defining "highly qualified teachers": What does "scientifically based research" actually tell us? *Educational Researcher*, 31(9), 13-25
- Ehrenberg, R. G., & Brewer, D. J. (1995). Did teachers' verbal ability and race matter in the 1960s? Coleman revisited. *Economics of Education Review*, 14, 1-21.
- Ferguson, R. F. (1998). Teachers' perceptions and expectations and the Black-White test score gap. In C. Jencks & M. Phillips

- (Eds.), *The Black-White test score gap* (pp. 273-317). Washington, DC: Brookings Institute.
- Goldhaber, D. D., & Brewer, D. J. (1997). Evaluating the effect of teacher degree level on educational performance. In W. J. Fowler (Ed.), *Developments in school finance, 1996* (pp. 197-210). Washington, DC: National Center for Education Statistics, U.S. Department of Education.
- Kemp, L., & Hall, A. (1992). Impact of effective teaching research on student achievement and teacher performance: Equity and access implications for quality education. Jackson, MS: Jackson State University: ERIC Document Reproduction Service No. ED 348 360.
- Kimball, S., M, White, B., Milanowski, A., & Borman, G. (2004). Examining the relationship between teacher evaluation and student assessment results in Washoe county. *Peabody Journal of Education*, 79(4), 54-78.
- Kupermintz, H. (2002). *Teacher effects as a measure of teacher effectiveness: Construct validity considerations in TVAAS*. Los Angeles, CA: CRESST/University of Colorado, Boulder.
- Mendro, R., Jordan, H., Gomez, E., Bembry, K., & Anderson, M. (In press). *Longitudinal Teacher Effectiveness over Four Years*. Dallas: Dallas Independent School District.
- Milanowski, A. (2004). The relationship between teacher performance evaluation scores and student achievement: Evidence from Cincinnati. *Peabody Journal of Education*, 79(4), 33-53.
- Monk, D. H. (1994). Subject area preparation of secondary math and science teachers and student achievement. *Economics of Education Review*, 13, 125-145.
- A Nation at Risk: The imperative of educational reform. (1983). Washington, D.C: U.S. Department of Education.

- Odden, A., Borman, G., & Fermanich, M. (2004). Assessing teacher, classroom, and school effects, including fiscal effects. *Peabody Journal of Education*, 79(4), 4-32.
- Porter, A. C. (2002). Measuring the content of instruction: Uses in research and practice. *Educational Researcher*, 31(7), 3-14.
- Raudenbush, S., W., & Bryk, A., S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd Ed.). Thousand Oaks, CA: Sage Publications.
- Sanders, W., L. (2000). *Value-added assessment from student achievement data*. Cary, NC: Create National Evaluation Institute.
- Sanders, W., L., & Rivers, J. C. (1996). *Cumulative and residual effects of teachers on future student academic achievement*. Knoxville: University of Tennessee Value-Added Research and Assessment Center.
- Rowan, B., Chiang, F. S., & Miller, R. J. (1996). Using research on employee performance to study the effects of teachers on students' achievement. *Sociology of Education*, 70, 256-284.
- Taylor, B. M., Pearson, D., Clark, K., & Walpole, S. (1999). Effective schools, accomplished teachers. *Reading Teacher*, 53(2), 156-159.
- The Teaching Commission. (2004). *Teaching at risk: A call to action*. New York, NY: The CUNNY Graduate Center.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Webster, W. J., Mendro, R. L., Orsak, T. H., & Weerasinghe, D. (1997, March). A Comparison of the Results Produced by Selected Regression and Hierarchical Linear Models in the Estimation of School and Teacher Effects. Paper presented at the Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.

- Wright, S. P., Horn, S., P., & Sanders, W., L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personal Evaluation in Education*, 11, 57-67.

REVIEW BOARD

- Peter W. Airasian, *Boston College*
Mark A. Albanese, *University of Wisconsin, Madison*
Lewis Allen, *League of Professional Schools*
Madeleine Arnot, *University of Cambridge*
Marie Brown, *University of Manchester*
John A. Beineke, *Arkansas State University*
Clete Bulach, *Professional Development and Assessment*
F. Stephan Burgess, *Southwestern Oklahoma State University*
James Carlson, *National Assessment*
Dan B. Carr, *Northwestern State University*
Earl Cheek, *Louisiana State University*
Joseph Claudet, *Texas Tech University*
M. Jerry Cline, *Emeritus, Virginia Tech University*
Libby G. Cohen, *ALL Tech*
Sherry Cormier, *Louisiana State University*
Robert L. Crain, *Teachers College*
Sharon Cramer, *Buffalo State College*
O. L. Davis, *University of Texas, Austin*
W. Alan Davis
A. Gary Dworkin, *University of Houston*
Anne Haas Dyson, *University of California*
Dilara Demirbulak, *Çankaya University*
Carol Anne Dwyer, *Educational Testing Service*